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Begin to Fight the Corn Borer Now

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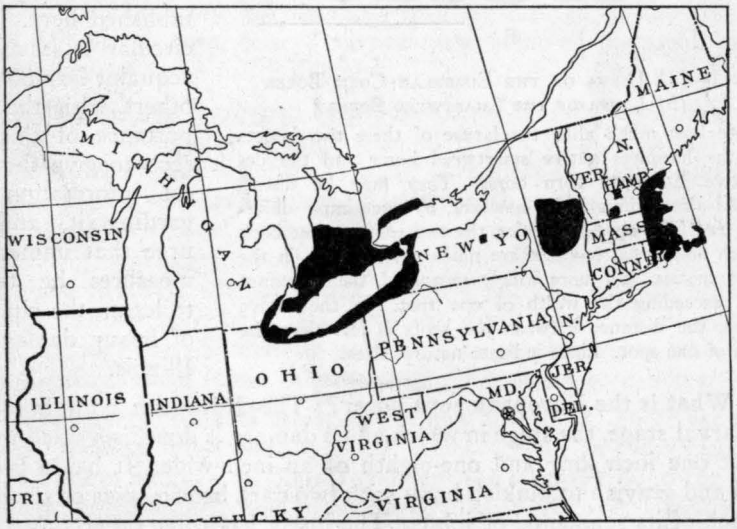

CORN BORER INFESTATION IN THE UNITED STATES AND CANADA

The above map shows the areas known to be infested with the European corn borer on October 1, 1923. This pest is now about 200 miles from Illinois, which is less than the distance across the state.

Begin to Fight the Corn Borer Now

By W. P. FLINT, Entomologist, Natural History Survey; J. C. HACKLEMAN, Chief in Crops Extension; and F. C. BAUER, Chief in Charge of Soil Experiment Fields

The European corn borer is probably the most destructive corn pest that has ever been found in the United States. In the last few years it has caused great damage to the corn crop in large areas in the eastern part of this country. While not known to have reached Illinois, it is only a short distance away, and may appear in this state at any time. To avoid the most serious damage, it is necessary to start control measures before the insect becomes established here. This circular is issued to acquaint farmers and others with the importance of this insect, to give the latest information regarding it, and to urge that immediate measures be taken to lessen the chances of heavy damage in Illinois.

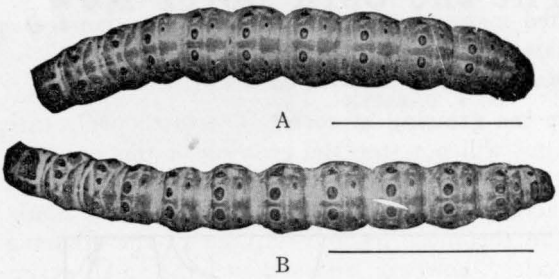

Fig. 1—*(a)* Larva of the European Corn Borer *(b)* Larva of the Smartweed Borer

Note how much alike the larvae of these two insects are—the harmless native smartweed borer and the destructive European corn borer. They may be distinguished almost invariably, however, by one simple difference. *In the European species,* the two spots on the back of each abdominal segment are much smaller than in the native species, and more widely separated, their distance apart exceeding the width of one spot. In the native species, the distance between the spots is less than the width of one spot. Lines indicate natural sizes.

What is the European corn borer? The European corn borer in the larval stage, the stage in which all its damage is done, is a small worm about one inch long and one-eighth of an inch wide. It has a brown head and grayish to pinkish body with two dark brown spots on the back of each of its segments, or joints. The insect has three other stages. In the adult, or moth stage, it has a wing expanse of a little over one inch. The female is a pale yellow to brown, with irregular dark lines running across the wings, and the male is usually dark brown with light lines on the wings. In the pupa stage the corn borer is about three-fourths of an inch in length by one-tenth of an inch wide, brown in color, and blunt at one end and pointed at the other. The eggs are shiny white in color and are laid in masses of fifteen or more, usually on the undersides of the leaves of plants (see Fig. 2).

How close is this pest to Illinois? The European corn borer is known to occur in counties in Ohio and Michigan not more than 200 miles east and northeast of Illinois.

Is it certain to reach Illinois? It is practically certain to reach Illinois. There has never been a case in which an insect as well established as the corn borer has not continued to spread until checked by some natural barrier such as mountain ranges or oceans. No such barriers are present between the infested area and Illinois. The adult insect is capable of flying twenty-five miles and with a favorable wind probably a greater distance. In the worm and pupal stages it is also carried in the drift of streams and lakes. If the insect reaches Illinois only by means of flight or infested material carried by streams, no damage is likely to occur in this state for several years, but *it may be brought in at any time in commercial shipments of infested material.*

Will the insect stop the growing of corn? The insect will cause serious damage to corn but will not stop the growing of this crop. It is probable that it will cause a reduction in corn acreage similar to the reduction of the cotton acreage caused by the boll weevil in the south. Corn will undoubtedly be the most severely injured of the common crops, but broom corn, celery, cowpeas, and some of the small grains will probably also be badly damaged.

Where did the European corn borer come from? It was probably brought to this country in shipments of broom corn from Italy and Hungary. The insect is known to occur over most of Europe and parts of Asia. It is a very serious pest of Indian corn in the areas in Europe where this crop is widely grown. It is also a pest of millet, hops, hemp, broom corn, and other crops. Its first appearance in the United States was noted in 1917, when farmers in the vicinity of Boston observed damage to their corn by a medium-sized worm boring in all parts of the plant and ear. Specimens were sent to entomologists who, after careful examination, found them to be the European corn borer.

What parts of North America are now infested? There are three general areas of infestation in North America: one in New England; one in eastern and central New York; and the largest around the shore line of Lake Erie, including an extensive area in Ontario, Canada, and parts of the states of New York, Pennsylvania, Ohio, and Michigan (see map on cover page). The insect is causing extensive damage to corn and other crops in the New England and Lake Erie districts, in the centers of which it is very difficult to grow sweet and field corn without serious loss. The losses in New York have not been heavy.

How does it injure corn? The insect, in the larval (worm) stage, bores into all parts of the stalk, ear, and tassel of the corn plant, and to some extent feeds upon the leaves. It usually does not work in

roots or below the surface of the ground. Three hundred and twelve borers have been taken from the plants in one hill of corn and forty-two from one ear. The injured stalks often fall; and the ears do not mature properly and are usually covered with fungus which renders the corn unfit for storage and feeding.

On what plants besides corn does it feed? The corn borer also feeds readily on barley, beans, broom corn, celery, cotton, cowpeas,

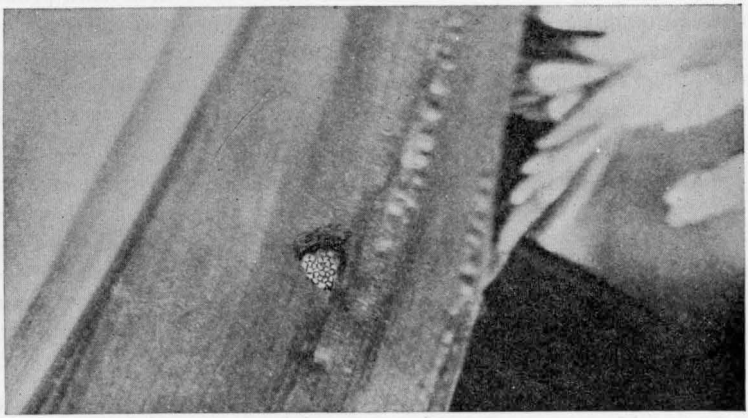

FIG. 2.—EGG-MASS OF CORN BORER ON A LEAF OF CORN (Natural size)

A female moth deposits an average of about 325 eggs during her lifetime. Altho many of the eggs are destroyed and many of the worms die before reaching maturity, the rate of increase is very rapid. The eggs are shiny white in color and are laid in masses of fifteen or more, usually on the undersides of leaves of favored food plants.

grain sorghums, sunflowers, sweet sorghum, hemp, hops, millet, peppers, potatoes, rhubarb, asters, beets, chrysanthemums, dahlias, gladiolus, and Swiss chard. In the most heavily infested areas it attacks oats, soybeans, Sudan grass, sweet clover, timothy, artichokes, buckwheat, calendula, cannas, cosmos, geraniums, golden glow, hollyhocks, Johnson grass, marigolds, mignonette, okra, parsnip, salvia, spinach, tobacco, tomatoes, zinnia, and many weeds and flowering plants, but it shows decided preference for the plants in the first list.

Is there a class of plants on which the borer does not feed? Most legumes (with the possible exception of cowpeas) are not seriously injured by this insect. It does not feed to any extent on the cucumber, melon, pumpkin, or squash, and a few other crop plants of minor importance.

How rapidly does the insect increase? The female moth deposits an average of about three hundred and twenty-five eggs. Some of these eggs are destroyed by parasites or other agencies and many of the worms die before reaching maturity, but the rate of increase is very rapid. In the New England areas the insect is two-brooded, but in other parts of North America there is but one brood. It is two-brooded in parts of Europe and will probably be two-brooded in the southern and central parts of Illinois. The injury done by the insect is more severe in the two-brooded areas.

Where does the insect pass the winter? In the worm or larval stage it winters in the plants on which it feeds and in some cases in other shelters such as soft wood and plant stems into which it burrows for protection from the weather.

What measures of control have been found most effective? The most effective measure thus far found is the destruction of the insects in the plants in which they pass the winter. Late planting of corn is of some value in the single-brooded areas. *Good rotations which allow all plant refuse to be removed from the field and utilized or plowed under before spring are of the greatest value.*

Will any of these measures be of value before the insect reaches Illinois? Where corn stalks are allowed to stand in the field during the winter, they furnish very favorable hibernating quarters for the borer. *The adoption of rotations and methods of handling our crops that will permit a clean-up of all crop refuse and field margins should be started before the borer reaches this state. Every farmer should plan now to remove and utilize or plow under all corn stalks before March 15 in southern Illinois and*

FIG. 3.—A "CLOSE-UP" OF A HILL OF CORN RUINED BY THE CORN BORER

The stalks are cut open to show the extensive feeding and tunneling of larvae within. (Medford, Mass.)

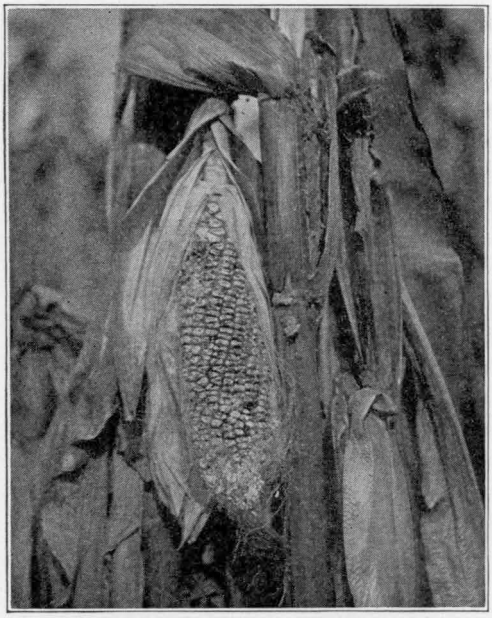

FIG. 4.—A "CLOSE-UP" OF DENT CORN SHOWING INJURY TO EAR AND STALK BY THE CORN BORER

The ear stem is broken over as a result of corn borer injury and larvae have fed upon the ear at tip, side, and base. (Cambridge, Mass.)

March 30 in northern Illinois.

Fighting the corn borer with crops in well planned rotations will be one of the most effective means of lessening damage by this insect. The following rotations are so arranged as to contain the maximum of crops not particularly attractive to the European corn borer—the legumes. Where attractive crops are grown, such as corn or oats, these crops do not, in so far as possible, follow each other in the same fields. The rotations given will be of value not only for the control of the European corn borer, but are also effective in combating the chinch bug.

Good three-year rotations

(1) Corn, soybeans, and wheat, with sweet clover sowed in the wheat and plowed under the following spring for corn.

(2) Corn, wheat, and clover: the clover to be sweet clover, mixed clovers, or any good biennial legume, and used largely as pasture and green manure.

Good four-year rotations

(1) Corn, soybeans, wheat, and red clover; the clover to be cut for seed and hay.

(2) Corn, soybeans, wheat, and alfalfa; the alfalfa to be used as a biennial legume seeded either in the wheat or in August after the wheat and turned under at the end of the second season as green manure.

(3) Corn, soybeans and oats, wheat, and clover, with the acreage in corn to be divided the next year between soybeans and oats. Rotations in which oats follow corn are not desirable except that they fur-

nish some oats for feed for horses. The corn stalk residue remaining on the ground will contain some borers which will infest the oats.

The Norfolk rotation of corn, oats, clover, and wheat would not be well adapted to corn borer conditions as it has two susceptible crops—corn and oats—following each other in the same field. Rotations (1) and (2) would not only give a protection against the European corn borer, but would also tend to lessen the damage by several other corn insects.

Good five-year rotations

(1) Corn, soybeans, small grain, clover, and wheat, with sweet clover sowed in the last wheat crop and plowed under in the spring for corn.

Good six-year rotations

(2) Corn, soybeans, oats, mixed clover, wheat, and alfalfa.

(3) Corn, soybeans, wheat, mixed clover, corn, and soybeans.

What insects may be confused with the European corn borer? A native borer which feeds on smartweed is abundant throughout Illinois and may sometimes be taken for the corn borer. This insect is very closely related to the European corn borer but does not cause any injury to cultivated crops in this state. The injury done to corn ears by the ear worm resembles that done by the European corn borer. The corn borer, however, feeds mainly within the plant and ear, while the corn ear worm feeds on the kernels and tips of the ear, seldom entering the stalk (see Fig. 4).

What help can we expect from the the insect enemies of the European corn borer? A study of the insects that prey upon the European corn borer has been conducted by the Federal Bureau of Entomology in this country and Europe. No very effective parasites have been found in this country. Several very promising parasites, however, have been found in Europe, and an attempt is being made to use them in this country. Through cooperation with the Federal Bureau of Entomology, the State Natural History Survey is now attempting to estabish in Illinois one of the most effective of these parasites. This parasite will feed on the harmless smartweed borer, and as this insect is generally abundant throughout Illinois, it seems probable that the parasite may be established here in advance of the European corn borer. Several thousands of these parasites have already been released. They may be of help in lessening the rapid increase of the borer.

Is there any quarantine measure in force to prevent the spread of this insect? Strict Federal, State, and Dominion quarantines have been placed on all known infested areas and have greatly reduced the chances of commercial spread of the insect, *but no quarantine, however strict, can prevent its natural spread.*

Make sure the corn borer is not on your farm. Perhaps the first and most useful thing that any farmer or gardener in this state can do to help in the campaign against this insect is to send to the Entomologist, Natural History Survey, Urbana, any insect which he suspects may be the European corn borer. In this way the centers of infestation may be discovered and early and vigorous measures taken to check their spread.

FIG. 5.—A CORN FIELD RUINED BY THE EUROPEAN CORN BORER

This picture tells its own story. It is typical of the devastation wrought in heavily infested areas. (Medford, Mass.) (Figs. 3, 4, and 5 furnished by Bureau of Entomology, U. S. D. A.)

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H. W. MUMFORD, *Director.*